

REMARKS

The final Official Action objects to the drawings for failing to include reference numeral 41 in Figure 8 as mentioned at page 16, line 25 of the specification. The specification has now been amended to delete mention of reference numeral 41 in conjunction with Figure 8. As such, the drawings now are consistent with the specification such that the objection to the specification is overcome. It is noted, however, that optical fiber 41 is depicted and identified by reference numeral 41 in Figures 1-3, and is correspondingly described by the specification in conjunction with those figures.

Relative to the claims, the allowance of Claims 8, 9, 24 and 25 is noted with appreciation. The remaining claims, that is, Claims 1-7, 10, 11, 17-23 and 26 continue to be rejected on the same grounds as in the first Official Action. In particular, the final Official Action continues to reject Claims 1, 2, 11, 17 and 18 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,317,387 to Cornelis G. Van Hengel et al. in view of U.S. Patent No. 5,895,927 to Jeff Lee Brown. The final Official Action also rejects Claims 5 and 21 under 35 U.S.C. §103(a) as being unpatentable over the Van Hengel '387 patent in view of the Brown '927 patent and in further view of U.S. Patent No. 3,817,635 to Ichizo Kawahara. Additionally, the final Official Action rejects Claims 6, 7, 9, 22, 23 and 25 under 35 U.S.C. §103(a) as being unpatentable over the Van Hengel '387 patent in view of the Brown '927 patent and the Kawahara '635 patent and in further view of U.S. Patent No. 6,633,378 to James L. Doyle, Jr. Finally, the Official Action rejects Claims 10 and 26 under 35 U.S.C. §103(a) as being unpatentable over the Van Hengel '387 patent in view of the Brown '927 patent and in further view of U.S. Patent No. 5,325,177 to Lauren M. Peterson.

In sum, the final Official Action submits that the recitation relating to the movement of the optical fiber in a radial direction toward and away from the hole wall which was added by amendment to independent Claims 1 and 17 defines an intended use which fails to patentably distinguish the claimed invention from the cited references since the probes of at least some of the cited references were capable of radial movement regardless of whether the cited references actually teach or suggest such radial movement of an optical fiber. For the reasons described below, however, Applicants submit that independent Claims 1 and 17, as well as the claims that

depend therefrom, are patentably distinct from the cited references, taken either individually or in combination. Dependent Claims 27 and 28 have been added that further recite the determination of the length of the hole based upon the identification of the backside of the hole. As these new claims depend from existing claims, these new dependent claims do not raise any new issues, are patentably distinct from the cited references for at least the same reasons as the independent claims as discussed below, and should therefore be substantively considered at this juncture. In light of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration of the present application and allowance of the current set of claims.

Independent Claim 17

The method of amended independent Claim 17 begins by introducing at least one optical fiber into the hole and transmitting light along the optical fiber and directing light from a distal end of the optical fiber toward the hole wall. Light that has reflected off the hole wall is received by the distal end of the optical fiber, and the intensity of the light reflected off the hole wall is measured to thereby permit different materials to be distinguished. Independent Claim 17 further recites “moving the optical fiber in a radial direction toward and away from the hole wall”. Movement of the optical fiber in a radial direction may be advantageous, such as in embodiments in which the light emitted from the optical fiber toward the hole wall is focused to a focal point such that the radial movement provided by the optical fiber permits the focal point to coincide with the hole wall as recited by dependent Claim 22, thereby facilitating improved measurement and characterization of the hole.

As noted above, the final Official Action dismisses the recitation relating to “moving the optical fiber in a radial direction toward and away from the hole wall” as an intended use of the claimed invention that is satisfied by the devices of the Van Hengel ‘387, Brown ‘927, Kawahara ‘635 and Peterson ‘177 patents since the probes of these devices are capable of radial movement even though the cited references do not teach or suggest radial movement of the probes. In particular, the final Official Action notes that “the optical fiber probe of Van Hengel et al is not a

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tight fit in the hole and therefore fiber is movable in a radial direction toward and away from hole wall.”

With respect to independent Claim 17, however, the recitation relating to “moving the optical fiber in a radial direction toward and away from the hole wall” is not an intended use. Instead, this recitation is an affirmative step of the method of measuring characteristics of a hole, just as are the introducing, transmitting, receiving and distinguishing steps. Thus, to anticipate or obviate the method of independent Claim 17, the prior art must teach or suggest each step including the step of “moving the optical fiber in a radial direction toward and away from the hole wall” and not merely capable of such movement without any teaching or suggestion.

Although the final Official Action contends that the Van Hengel ‘387, Brown ‘927, Kawahara ‘635 and Peterson ‘177 patents describe devices having probes capable of such radial movement, none of these references teach or such the radial movement o f an optical fiber toward and away from the hole wall as recited by independent Claim 17. Instead, while several of the references, including the primary reference, that is, the Van Hengel ‘387 patent, are silent and therefore do not teach or suggest movement of the optical fiber in a radial direction toward and away from the hole wall, the Brown ‘927 patent specifically teaches away from any such radial movement by specifying that the probe moves “along the cylindrical axis of the interior surface”. See column 12, lines 22-23 of the Brown ‘927 patent.

Applicants note that while the final Official Action does not contend that the device of the Doyle 378 patent is capable of radial movement in the same manner as the other cited references, both the first Official Action and the final Official Action rely upon the Doyle ‘378 patent for its apparent disclosure of the movement of an optical fiber in a radial direction. The Doyle ‘378 patent does not, in fact, teach or suggest the movement of the optical fiber in a radial direction toward and away from the hole wall, as recited by independent Claim 17. Instead, the Doyle ‘378 patent recites that “the scanning probe 1 is translated along the axis of the tube or pipe that is being inspected”. See column 5, lines 19-21 of the Doyle ‘378 patent. Thus, the Doyle ‘378 patent also teaches away from the movement of the optical fiber in a radial direction toward and away from the hole wall, as recited by independent Claim 17.

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Additionally, the final Official Action notes that the Van Hengel '387 patent does not describe "an optical probe having at least one optical fiber to direct light radially toward a hole-wall and to receive light reflected off the hole-wall" and cites the Brown '927 patent for its disclosure of "an optical probe 10 ... having at least one optical fiber 30 to direct light radially toward a hole-wall 14 and to receive light reflected off the hole-wall 14". Unlike the method of independent Claim 17 in which at least one optical fiber is introduced into the hole and light is transmitted along the optical fiber and directed from a distal end of the optical fiber toward the hole wall, the optical fiber of the Brown probe does not direct light radially toward the hole wall. Instead, the optical fiber of the Brown probe projects light along the longitudinal axis of the probe for redirection by the tip 24 of a mirror 26 toward the hole wall. Thus, the Brown '927 patent also fails to teach or suggest this aspect of independent Claim 17. Although not cited by the final Official Action for this proposition, it is noted that the other cited references also fail to teach or suggest a method that directs light from a distal end of the optical fiber toward the hole wall.

Since none of the cited references, taken either individually or in combination, teach or suggest either "moving the optical fiber in a radial direction toward and away from the hole wall" or "directing light from a distal end of the optical fiber toward the hole wall", the rejection of independent Claim 17, as well as the claims that depend therefrom, is therefore overcome.

Independent Claim 1

Independent Claim 1 is directed to an apparatus for measuring characteristics of a hole and includes at least one optical fiber capable of being introduced into the hole. The optical fiber directs light radially toward a hole wall and receives light reflected off the hole wall. The apparatus also includes a light source for providing light to the optical fiber and an optical receiver for receiving light from the optical fiber that has been reflected off the hole wall and then received by the optical fiber. The optical receiver is also adapted to measure the intensity of the light reflected off the hole wall so as to permit different materials to be distinguished. Like independent method Claim 17, the apparatus of independent Claim 1 further recites that the "optical fiber is movable in a radial direction toward and away from the hole wall." As

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described above in conjunction with independent method Claim 17, the movement of the optical fiber toward and away from the hole wall may be advantageous and may improve the measurement and characterization of the hole in some embodiments.

As noted above, the final Official Action rejects Claim 1 as being obvious over the combination of the Van Hengel '387 patent in view of the Brown '927 patent. In this regard, the final Official Action notes that the Van Hengel '387 patent does not describe "an optical probe having at least one optical fiber to direct light radially toward a hole-wall and to receive light reflected off the hole-wall" and cites the Brown '927 patent for its disclosure of "an optical probe 10 ... having at least one optical fiber 30 to direct light radially toward a hole-wall 14 and to receive light reflected off the hole-wall 14". Unlike the apparatus of independent Claim 1 in which the optical fiber "directs light radially toward the hole wall", the optical fiber of the Brown probe does not direct light radially toward the hole wall, as described above in conjunction with independent Claim 17. Thus, the Brown '927 patent also fails to teach or suggest this aspect of independent Claim 1.

Independent Claim 1, as well as the claims that depend therefrom, are therefore not taught or suggested by the Van Hengel '387 patent, the Brown '927 patent nor any of the other cited references since no proper combination of these references teaches or suggests an apparatus that includes, in combination with the other elements, an optical fiber for directing light radially toward the hole wall. It is accordingly submitted that the rejection of independent Claim 1, as well as the claims that depend therefrom, is overcome.

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CONCLUSION

As no new issues are raised, Applicants appreciate the Examiner's substantive consideration and entry of this Amendment. In view of the amendment to the specification and the remarks presented above, it is respectfully submitted that all of the claims of the present application are in condition for immediate allowance. It is therefore respectfully requested that a Notice of Allowance be issued. The Examiner is encouraged to contact Applicants' undersigned attorney to resolve any remaining issues in order to expedite examination of the present application.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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